

# Unit Planning Guide: Grade 7 PreAlgebra Unit 1 of 5

<b>Unit Title:</b> Rational and Irrational Numbers	<b>Pacing (Duration of Unit):</b> 10 Weeks (1 Quarter)
<b>Grade:</b> 7 Pre-Algebra	<b>Buffer Day(s):</b> 5 days (1 week)

## Desired Results

### Transfer Goals (Priority practice standards in **bold**)

**Students will be able to independently use their learning to:**

- MP.1. **Make sense of problems and persevere in solving them.**
- MP.2. **Reason abstractly and quantitatively.**
- MP.3. Construct viable arguments and critique the reasoning of others.
- MP.4. Model with mathematics.
- MP.5. Use appropriate tools strategically.
- MP.6. **Attend to precision.**
- MP.7. Look for and make use of structure.
- MP.8. Look for and express regularity in repeated reasoning.

### Established Goals (2011 MA Curriculum Frameworks Standards Incorporating the Common Core State Standards)

#### Prerequisite Standards:

- 5.NBT.1: Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
- 5.NBT.4: Use place value understanding to round decimals to any place.
- 5.NS.MA.1: Use positive and negative integers to describe quantities such as temperature above/below zero, elevation above/below sea level, or credit/debit.
- 6.NS.1: Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for  $(\frac{2}{3}) \div (\frac{3}{4})$  and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that  $(\frac{2}{3}) \div (\frac{3}{4}) = \frac{8}{9}$  because  $\frac{3}{4}$  of  $\frac{8}{9}$  is  $\frac{2}{3}$ . (In general,  $(\frac{a}{b}) \div (\frac{c}{d}) = \frac{ad}{bc}$ .) How much chocolate will each person get if 3 people share  $\frac{1}{2}$  lb of chocolate equally? How many  $\frac{3}{4}$ -cup servings are in  $\frac{2}{3}$  of a cup of yogurt? How wide is a rectangular strip of land with length  $\frac{3}{4}$  mi and area  $\frac{1}{2}$  square mi?*
- 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.5: Understand that positive and negative numbers are used together to describe quantities having opposite

#### WIDA for English Language Learners

Standard 1: ELLs **communicate** for **Social** and **Instructional** purposes within the school setting

Standard 3: ELLs **communicate** information, ideas and concepts necessary for academic success in the content area of **Mathematics**

In the lesson planning stage, teachers will need to differentiate lessons for ELLs. In order to accomplish this they will need: 1.) this curriculum map, 2.) a list of their ELLs and their proficiency levels, and 3.) appropriate language function expectations and scaffolds or supports.

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directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

- 6.NS.6a: Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g.,  $-(-3) = 3$ , and that 0 is its own opposite.
- 6.NS.7: Understand ordering and absolute value of rational numbers.
- 6.EE.1: Write and evaluate numerical expressions involving whole-number exponents.

### Standards (Priority Standards in **bold**):

- 7.NS.1: Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
  - 7.NS.1a: Describe situations in which opposite quantities combine to make 0.
  - 7.NS.1b: Understand  $p + q$  as the number located a distance  $|q|$  from  $p$ , in the positive or negative direction depending on whether  $q$  is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
  - 7.NS.1c: Understand subtraction of rational numbers as adding the additive inverse,  $p - q = p + (-q)$ . Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
  - 7.NS.1d: Apply properties of operations as strategies to add and subtract rational numbers.
- 7.NS.2: Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
  - 7.NS.2a: Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as  $(-1)(-1) = 1$  and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
  - 7.NS.2b: Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If  $p$  and  $q$  are integers, then  $-(p/q) = (-p)/q = p/(-q)$ . Interpret quotients of rational numbers by describing real-world contexts.
  - 7.NS.2c: Apply properties of operations as strategies to multiply and divide rational numbers.
- **7.NS.3: Solve real-world and mathematical problems involving the four operations with rational numbers**
- 8.NS.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion that repeats eventually into a rational number.
- 8.NS.2: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g.,  $\pi^2$ ).
- 8.EE.1: Know and apply the properties of integer exponents to generate equivalent numerical expressions.

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- **8.EE.2:** Use square root and cube root symbols to represent solutions to equations of the form  $x^2 = p$  and  $x^3 = p$ , where  $p$  is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes.  
Know that  $\sqrt{2}$  is irrational.
- **8.EE.3:** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
- **8.EE.4:** Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

### Meaning (\*Mostly assessed through Performance Tasks/Assessments)

#### Big Ideas:

- Demonstrate the ability to apply the algorithms for the four operations using rational numbers to solve real-life problems.
- Estimate and evaluate expressions with square roots and cubic roots.
- Express and interpret quantities written in scientific and decimal notation.

These big ideas are written more like skills.

**Essential Questions:** (Questions which frame ongoing and important inquiries about the big ideas. They are written for students and used in daily instruction to help engage students in meaningful thinking.)

- How do I recognize what strategy to use for a specific problem?
- What conditions justify the use of scientific and decimal notation?
- How do I take apart and recombine numbers in a variety of ways for finding sums and differences?
- When is estimation more appropriate than finding an exact answer?

### Acquisition (\*Mostly assessed through traditional summative assessments)

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**Knowledge:** Key basic concepts, facts, and key terms (written in phrases) students should be able to recall independently.

***Students will know ...***

- That the commutative property is closed in the set real numbers under addition and multiplication.
- That the associative property is closed in the set of real numbers under addition and multiplication.
- The distributive property is closed in the set of real numbers under addition and subtraction.
- The identity property of addition and multiplication ...
- That rational numbers can be written as fractions and as decimals that terminate or repeat.
- That opposite quantities combine to make 0.
- Know that the absolute value of a number is its distance from zero on the number line.
- Know that two rational numbers on the real number line have a distance that is equal to the absolute value of their difference.
- Square numbers and their roots
- The difference between rational and irrational numbers
- Cube numbers and their roots
- The Real Number System (Whole, Integers, Rational and Irrational)
- The properties of integer exponents
- Numbers can be expressed in powers of ten

**Key Academic Vocabulary:**

- Rational Number
- Absolute Value
- Additive Inverse
- Square root
- Cube root
- Irrational Numbers
- Scientific Notation

**Skills:** The discrete skills and process students should be able to use independently.

***Students will be skilled at:***

- Identifying and classifying rational numbers
- Applying the concept of absolute value of rational numbers in real world context.
- Adding and subtracting rational numbers (integers, decimals and fractions), including using a number line.
- Identifying and using properties of rational numbers
- Using the additive inverse to subtract rational numbers
- Identifying and placing rational numbers on vertical and horizontal number lines
- Multiplying and dividing rational numbers (integers, decimals and fractions)
- Applying the properties of operations
- Recognizing and applying the distributive property
- Converting rational numbers into decimals
- Identifying the appropriate operation by using key words in real-world problems
- Describing situations in which opposite quantities combine to make 0.
- Interpreting sums, differences, products and quotients of rational numbers by describing real-world contexts.
- Evaluating small perfect square and cube roots
- Using square root and cube root symbols to represent solutions to equations
- Converting repeating decimals to fractions
- Approximating an irrational number and locating it on a number line
- Ordering Real Numbers
- Converting large and small numbers into scientific notation
- Perform operations with numbers expressed in scientific notation

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Resource Suggestions: